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USDA's Plant Genome Research Program

by Susan McCarthy
Coordinator, Plant Genome Data and Information Center

Genome: The Genetic Program

A fundamental property of living organisms is the ability to reproduce themselves. This ability is possible because the instructions of building plans for every working part have been stored in the genetic code. *A genome quite simply is this collection of genetic instructions, the owners guide and manual.* These instructions have been stored in the chemical form of deoxyribose nucleic acid, commonly known as DNA. When needed, the instructions are recalled from the DNA molecule and transcribed to a messenger molecule of ribose nucleic acid, RNA. This messenger is then translated into proteins, and these proteins perform the functions needed to build, develop, and run the biological entity. It is these gene products that are of the most interest to mankind.



The logo of the Plant Genome Research Program and also of the Plant Genome Data and Information Center.

They include the foods we eat; the fibers we use for clothing, structural materials, and paper; drugs to ease illnesses; and other specialty products. All of these products are themselves the products of one or many genes.

USDA Plant Genome Research Program

The U.S. Department of Agriculture established and funded the Plant Genome Research Program in 1991. The short term goal of this project is to expedite the work of crop breeders, who require the tools to evaluate their genetic breeding stocks quickly and cost effectively. The long term goal for the program is to tailor agronomic products to meet critical needs. Increasing

NOTICE

NATIONAL AGRICULTURAL LIBRARY TELEPHONE NUMBERS CHANGING

On December 16, 1991, all of the telephone numbers in the National Agricultural Library will be changing. The 7-digit local number for all NAL staff and services will change. The FTS number will have a different 3-digit exchange number, but the last 4 digits will be the same as for the local number. The area code will not change. See the new phone number listing for **Key NAL Personnel and Services** on pages 22-23 of this issue of *ALIN*. See the last page for the **Contents** of this issue of *ALIN*.

agricultural productivity may be achieved by breeding crops to enhance their tolerance to drought or other environmental stressors that are forecast by global change, and their resistance to pests and diseases, thereby preserving a safe environment and decreasing the need for chemical applications to soils. Unique marketplace niches can be found for crops genetically modified to produce products with higher nutritional quality or speciality chemicals.

The USDA Plant Genome Research Program is a multi-agency cooperative effort.

- The Agricultural Research Service (ARS) is the lead agency, and Dr. Jerome Miksche is the Program Director. In developing this interagency program, Dr. Miksche is utilizing existing programs and expertise. In this way he has facilitated the distribution of resources and accelerated program development with less administrative overhead than would normally have been anticipated. The five year plan for the program is illustrated in Figure 1.

NAL and the Plant Genome Research Program

The article by Susan McCarthy, combined with supplemental information in this issue of ALIN, provides a good overview of NAL activities in support of the USDA Plant Genome Research Program.

This program is an outgrowth of a collaborative planning effort between NAL, the Agricultural Research Service, and the Cooperative State Research Service that began in the summer of 1988. That effort culminated in the joint sponsorship of a Crop and Forest Genome Mapping Conference in Washington, D.C., in December of 1988. With the report of that conference at hand, Clayton Yeutter, as one of his first acts as the newly-appointed Secretary of Agriculture in February 1989, announced there would be a USDA Plant Genome Research Program. The rest of that fiscal year, and fiscal year 1990, were devoted to planning the program; it has been underway since funding was approved in late 1990.

Should you desire a brief, but thorough, description of the USDA Plant Genome Research Program as a whole, please request a copy of the following pamphlet from the Plant Genome Data and Information Center (address is in Susan McCarthy's article, page 5): **USDA Plant Genome Research Program. USDA Agricultural Research Service publication ARS-94, June 1991. 9pp.**

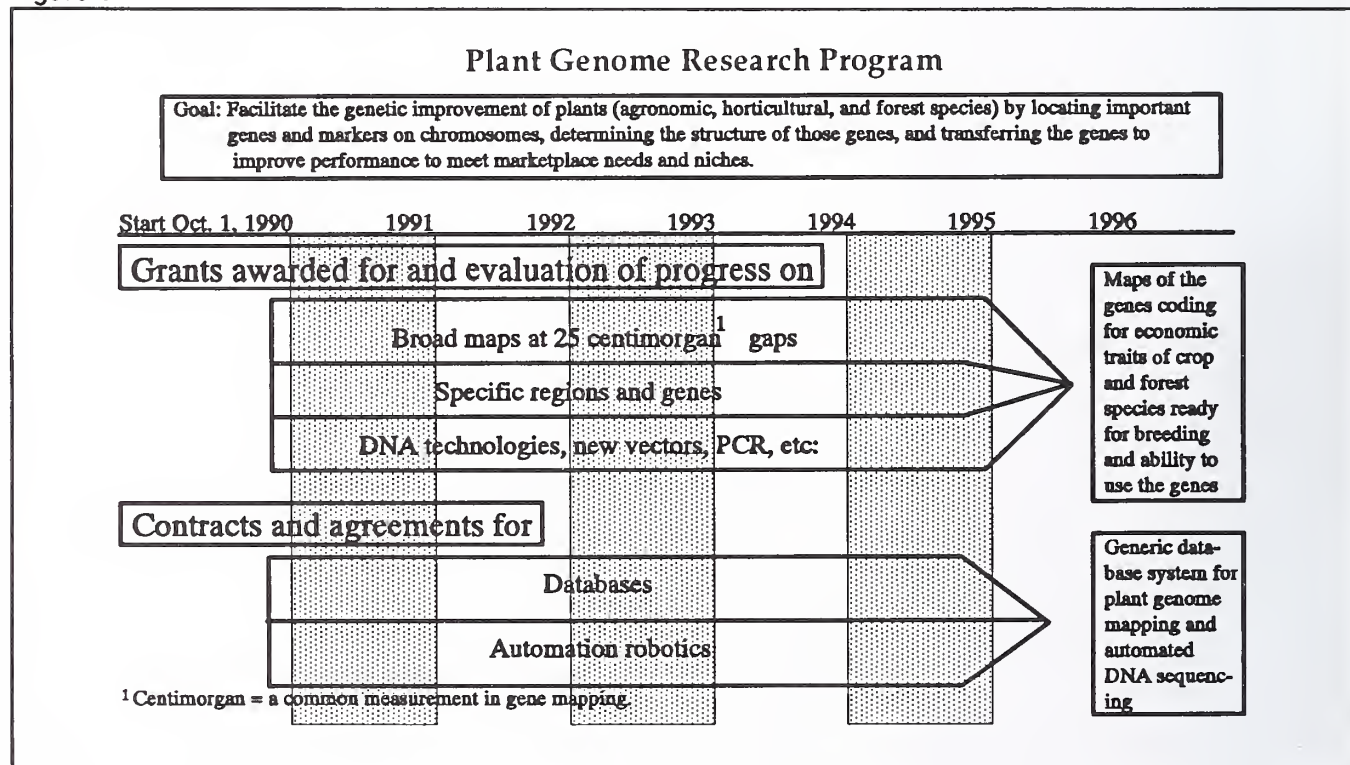
We are excited about the NAL role in this program, and via ALIN and other publications and presentations we will keep you advised of progress and changes. As always, if you have special interests in this field, or ideas for ways NAL and your organization can work together on activities related to this program, please contact me, Susan McCarthy, or another member of the NAL staff.

—Keith Russell

- The Cooperative State Research Service (CSRS) will administer the competitive grants portion of the Program. The grants will be awarded in three basic categories:

1. Low resolution genetic maps in crop species that

Figure 1



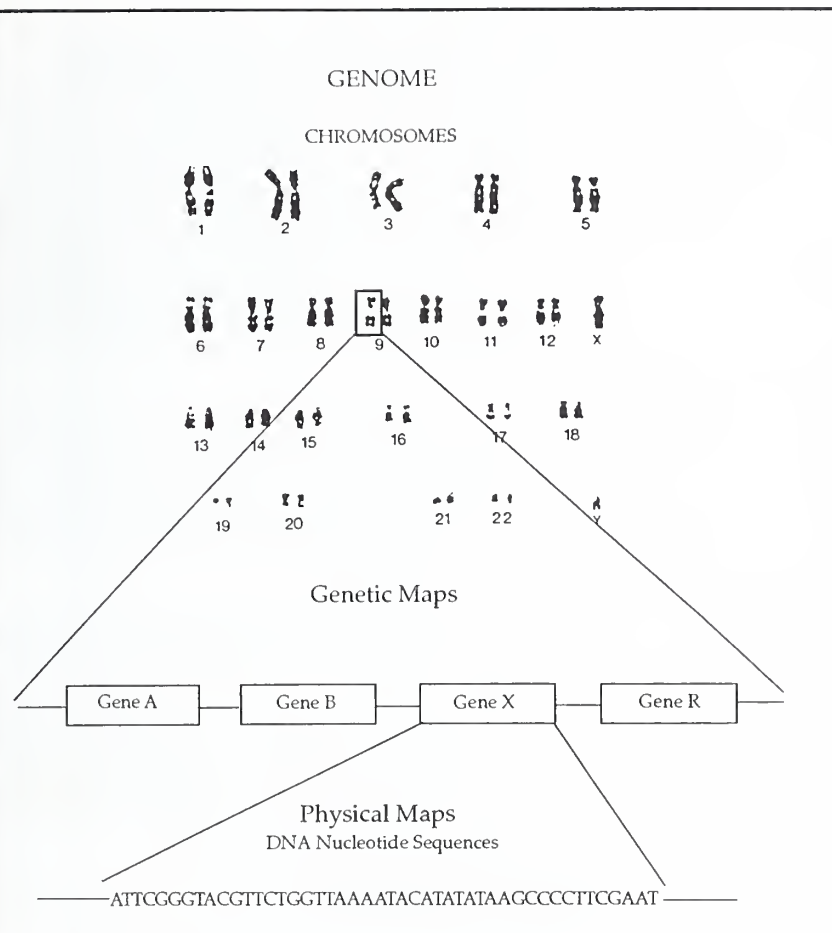


Figure 2

have not yet received much research funding, such as onions and strawberries.

2.High resolution maps in crop species that already have a significant amount of genetic research, like

corn and soybeans. In this category some grants will be awarded for the isolation of important genes and the mechanisms which control their expression, for example, insect and disease resistance genes.

3.New technologies for innovative methods to reduce program costs and expedite gene isolation protocols.

- The National Agricultural Library will develop the master database for the Plant Genome Program. This database will unify the designs from the individual species groups. NAL will also develop the bibliographic citations and provide the communication/outreach services for the Program.

Three main tools needed by the plant breeders are: genetic maps (see Figure 2); a database for the storage, retrieval and analysis of the data; and the isolation and use of economically important genes. These are the areas of priority funding for the Program.

Plant Genome Database

There will be an explosion of scientific data and information coming from the Plant Genome Research Program. This information is useful only if it is collated and readily available. The information must be located, collected, analyzed, organized, and stored in an easily retrievable system. Four laboratories within the Agricultural Research Service and the Forest Service have

received grants to develop prototype databases for each of four demonstrator crops; corn, wheat, soybeans, and pine. With four independent databases being developed, Dr. Miksche's goal is to ensure that by the end of the third program year a model will be functional, and the breadth of species included in the demonstration projects will ultimately result in the most general and useful public database. This model will set the data elements and for-

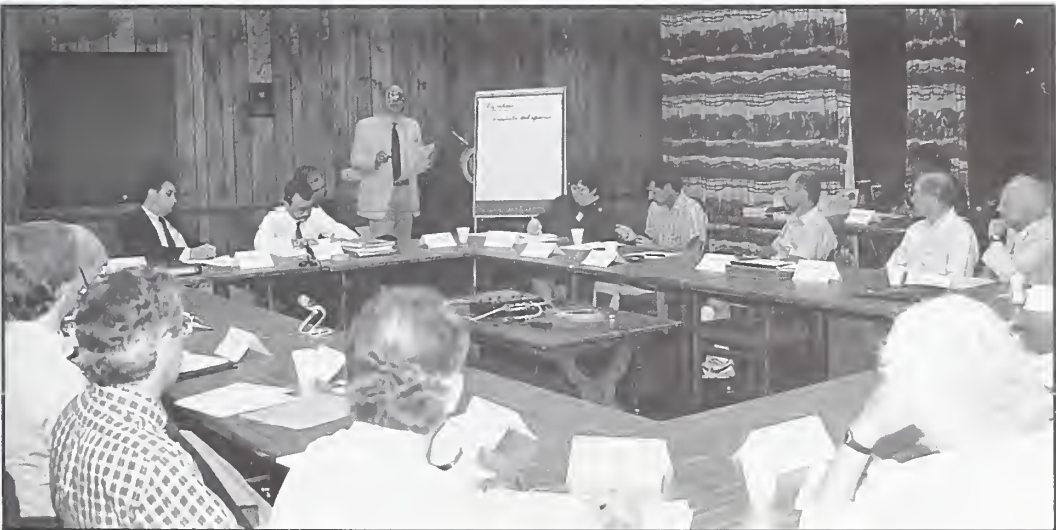


photo: D. Starr

The technical committee meeting to plan the Plant Genome database at NAL in July.

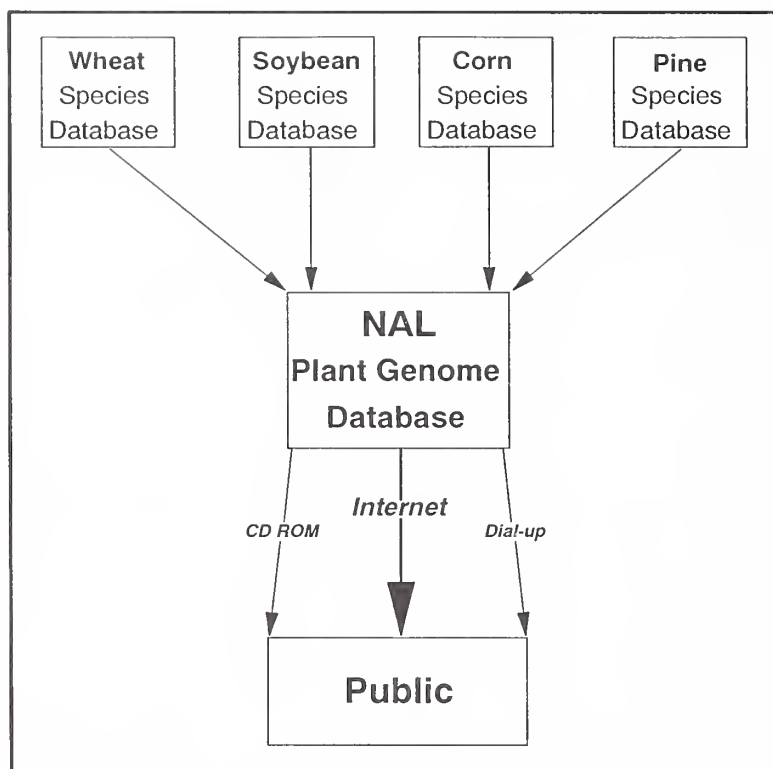


Figure 3

mat standards for the other crop species research results.

The National Agricultural Library's role, designed by Dr. Miksche and NAL officials, will be to unify the prototype databases into a single general (that is species independent) database (see Figure 3 on page 4). NAL shall then provide the public access for the database. The Plant Genome Research Program through CSRS competitive grants eventually may fund genome research on as many as 71 different crop species. A centralized database is vital to maximize the research results from the wide-ranging genetic backgrounds.

Plant Genome Database Development

In July, NAL convened a database workshop with experts to discuss the nature, goals and direction for the public access database. Participants included database specialists from the University of California, Los Alamos National Laboratory, National Science Foundation, and USDA's Germplasm Resource Information Network. Subject specialists from Yale, Harvard, and Rutgers Universities, and the International Society of Plant Molecular Biologists were also present.

The group decided that the database will be a relational model using UNIX

machines on which to mount the database. A relational database allows compression in data storage. This is important because of the very large amounts of data that will emerge from the research. In a relational database all data elements are entered into tables. By using a relational database, each element is recorded only one time. Relationships between all of the entities in the database will have been predetermined. This allows the user to call up all related pieces of information. A UNIX machine is basically a computer adapted for multiple tasking and multiple users.

As a result of these choices, the Plant Genome Database will be compatible with many of the programs that have been developed for the Human Genome Program. This will allow a free and easy exchange of data and tools between the two programs.

A model database will be available for evaluation by the end of 1992, and it is anticipated that a general database will be available for public access within three years. The database will be accessible via **Internet**, a telecommunications network. There also will be several direct dial-up connections, and at a later date, CD-ROM and magnetic tape distribution will be available.

Additional Roles for NAL: AGRICOLA Enhancement

In addition to work on the database, NAL is developing a comprehensive collection of plant genome literature. The library also is enhancing the AGRICOLA database in three

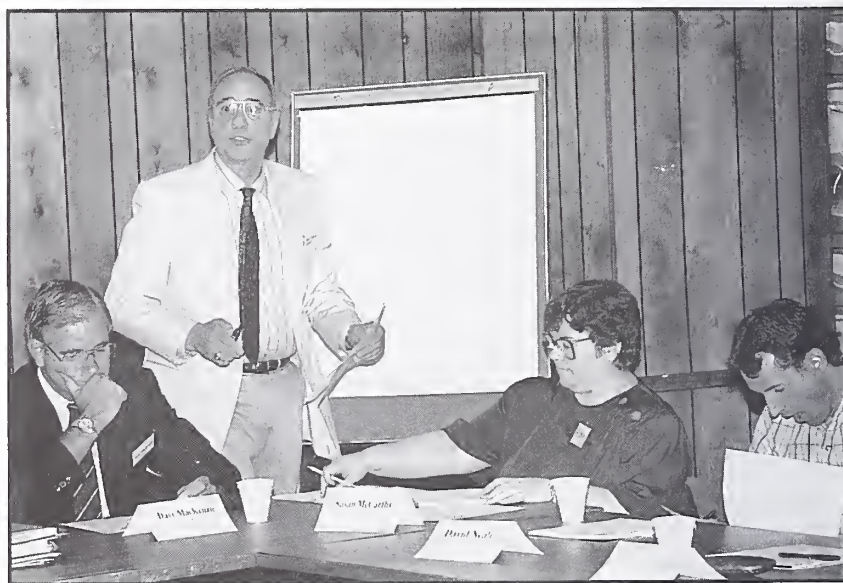


photo: D. Starr

Jerome Miksche begins a presentation at the Plant Genome Database planning meeting. Participants included David MacKenzie(L), Director of the National Biological Impact Assessment Program, CSRS; Susan McCarthy, Coordinator, PGD/C, NAL; and David Neale, Principal Investigator for the Loblolly Pine Plant Genome Database, Forest Service.

ways:

- **Increased plant molecular genetics citations and abstracts.** NAL staff examined the AGRICOLA records and identified journals with author abstracts and plant genome-relevant content. Author abstracts are being scanned and added to the bibliographic records. In the past 6 months, there has been a 42% increase in the plant molecular genetics citations having author abstracts. (See Sarah Thomas' article in this issue of *ALIN*, beginning on p. 7.)
- **Increased indexing of 14 journal titles.** Analysis in areas such as Computational Genetics, and the journal sources for the GenBank database have shown the value of adding fourteen relevant journals to the list of journals indexed. Some key journals include *Nucleic Acids Research*, *Plant Molecular Biology*, and *Computer Applications in Biological Sciences*.
- **A Molecular Sequence Data field added to AGRICOLA records.** This field indicates the presence of nucleotide or amino acid sequence data in the article.

Probe, A quarterly Newsletter

Communication both within and without the Plant Genome Research Program is essential because there is an enormous task to accomplish and resources are scarce. The staff of NAL's Plant Genome Data and Information Center

Prototype Database Coordinators

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Loblolly Pine

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USDA/Forest Service
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(PGDIC) are publishing a quarterly newsletter, *Probe*, for the Plant Genome Research Program. The newsletter is a link between Plant Genome Research Program managers and their users, and potential users. Some of the items that will be discussed in future issues include: standardization of nomenclature and working towards database compatibility; developments in the NAL database; progress on the demonstrator prototype databases; legislative issues, including funding levels and regulations; the nature of other genome programs and their funding; information about the competitive grants program; software for data analysis; reports from the program director's office; general interest and scientific developments.

Probe is available internationally to scientists, educators, the private sector, and anyone interested in the Plant Genome Program. To receive the newsletter, requestors may enter a four line mailing address on ALF (Agricultural Library Forum), NAL's electronic bulletin board, addressed to Terry Henrichs' mail box, or they may contact Terry Henrichs at phone: 301-344-3875; or FAX 301-344-6098. Requestors may also mail requests to:

*Plant Genome Data & Information Center
National Agricultural Library, Room 1402
10301 Baltimore Boulevard
Beltsville, MD 20705-2351*

Plant Genome Reference Services

PGDIC staff will provide information on all aspects of plant genome mapping; identify current genome mapping research; refer users to organizations or experts in the plant genome subject area; and perform brief searches of the AGRICOLA (*AGRICultural OnLine Access*) database and other bibliographic databases on a complimentary basis or exhaustive searches on a cost-recovery basis. The PGDIC staff also will furnish users with relevant *Quick Bibliographies (QB's)*, *Special Reference*



photo: D. Starr

Discussing issues raised at the Plant Genome Database planning meeting were (L-R) Michael Cinkosky, GenBank, Los Alamos National Laboratories; Doug Bigwood, Plant Genome Database Manager, PGDIC, NAL; and Stephen Heller, Informatics Project Leader, ARS.

Genetics Lectures on Video

The Plant Genome Data and Information Center sponsored a genetics lecture series for NAL staff development. Nine hours of lectures were given by Dr. Paul J. Bottino, Professor, University of Maryland. The lectures were designed for the educated layman to explain classical and molecular genetics. The lectures were videotaped and are available for circulation. The series title is *Introduction to genetics and biotechnology*.

Lecture Title: Chromosomes and cell division

Discusses the life cycle of cells, chromosomes, mitosis, meiosis, duplication of cell material, and crossing over along chromosomes. Additional discussion covers haploid and diploid states.

NAL Call Number: Videocassette #1000
79 minutes/ 1 cassette

Lecture Title: Mendelian Genetics, Linkage and Mapping

Discusses segregation of cell material, independent assortment of alleles, and the relationship between linkage and genetic mapping and phenotypes. Also discusses mapping human genes by cell hybridization.

NAL Call Number: Videocassette #1001
79 minutes/ 1 cassette

Lecture Title: Nucleic Acids

Discusses cell replication, how RNA works within the cell to regulate it, how RNA is synthesized and its relationship to the genetic code of the cells and chromosomes.

NAL Call Number: Videocassette #1002
90 minutes/ 1 cassette

Lecture Title: DNA Technology

Discusses restriction enzymes and how they are used to cut DNA, restriction sites, enzyme recognition, bacterial plasmids, use of complementary base pairing, enzymology, and gel electrophoresis. Also discusses how DNA technology is used for plant disease, virus and herbicide resistance and for gene therapy.

NAL Call Number: Videocassette #1003
190 minutes/ 2 cassettes

Lecture Title: RFLP Technology

Discusses restriction fragment polymorphisms, relationship to chromosome walking, restriction mapping, and looking for a linkage between RFLP's and a phenotype, which will then lead to the gene causing the phenotype.

NAL Call Number: Videocassette #1004
90 minutes/ 1 cassette

Briefs (SRBs), and user guides to literature; and assist users in accessing the extensive NAL collection. For more information on PGDIC, contact Susan McCarthy, Coordinator, Plant Genome Data and Information Center at the address and phone numbers listed above.

USDA's Plant Genome Program Looks to the Human Genome Project

The Human Genome Program is several years ahead of the USDA Plant Genome Program. While the goals of the Human Genome Program differ from the Plant Genome Program many of the methods and analytical tools are similar and compatible. This collaboration and exchange is developing on national and international levels.

Nationally, the USDA Plant Genome Program has consulted with database specialists working with GenBank (NIH funded, national nucleotide sequence database). Several prototype groups are working with the computer scientists from the Lawrence Berkeley Laboratory (LBL). LBL has been working with the Department of Energy and its Human Genome Program. USDA's Corn prototype group is working with scientists who have developed an *E. coli* stock center database. *E. coli* is a Human Genome model organism. USDA is also funding database efforts using *Arabidopsis thaliana*. This group is working with a database designed for the round worm *C. elegans* (another model organism studied in the Human Genome Program).

Internationally, the Plant Genome Program has met with representatives from the Japanese Rice Genome group, and the United Kingdom Arabidopsis group. This last summer the Acting Director of the French Human Genome Program met with Dr. Jerome Miksche, Director of the



photo: D. Starr

Susan McCarthy discusses the Plant Genome Database with David Neale (L), Principal Investigator for the Loblolly Pine Database, Forest Service, and Olin Anderson (R), Principal Investigator for the Wheat Database, Western Regional Research Center, ARS.

Plant Genome Database Activities in ISD

The Information Systems Division has responsibility for supporting database development activities for the Plant Genome Data and Information Center. During 1991, the database management team has been analyzing the system requirements for the Agricultural Genome Database System. In exploring current database activities in the genetics area, NAL staff have been working with such diverse centers as the National Center for Biotechnology Information, the European Molecular Biology Laboratory, Jackson Labs, and Dupont.

The analysis phase culminated with a meeting of the Technical Advisory Committee meeting in July 1991. This meeting included representatives from key disciplines cooperating in the USDA plant genetics program, as well as experts in computer science. At that meeting, it was determined that NAL would take a lead role in coordinating design activities for the USDA cooperators.

During the design, NAL will work with USDA cooperators to develop a "generic" plant genome database design. The database will be designed to run on UNIX systems using the Sybase database management system. Work is now underway on the database design, and a prototype database is scheduled to be completed in the Spring of 1992.

—Pam Andre

Plant Genome Activities in TSD in Fiscal Year 1991

The NAL Technical Services Division is performing a variety of tasks in support of the Plant Genome Data and Information Center (PGDIC). These include enriching NAL's collection through the selection, acquisition, and processing of new materials, and enhancing the scope of the AGRICOLA database through abstracts, additional citations, and inclusion of data related to sequencing, and improving access to materials through analysis of genetics terminology and updating thesaurus terms.

New Materials

NAL's Acquisitions and Serials Branch purchased about \$36,000 worth of materials related to plant genome in fiscal year 1991. These included approximately 400 serials, monographs, and various non-print databases. (See box listing new "Plant Genome Journals" on page 10.) Additional copies of high demand journals relevant to the activities of PGDIC augment NAL's collection and facilitate document delivery; for example: *Biochemical Genetics*; *Genome*; *Molecular & General Genetics*; *Nucleic Acids Research*; and *Plant Molecular Biology*.

Processing

A number of changes were necessitated in the creation of bibliographic citations because of the special nature of the proposed Agricultural Genome Database. After consulting with staff of the National Library of Medicine and NAL's Information Systems Division, Technical Services staff developed and implemented

procedures through which items containing sequence data could be identified. Specifically, both cataloging and indexing records created after October 1990 will contain the following information, when appropriate:

- 1) If an actual nucleotide or amino acid sequence is printed in the piece at hand or deposited in a databank, the field 653 (an identifier) MOLECULAR SEQUENCE DATA is added to the citation.

- 2) If the piece at hand references a databank where the sequence data have been deposited, the field 653 (an identifier) and the "Databank abbreviation", e.g., SWISSPROT, or "Databank abbreviation/Accession number", e.g., GEN-

USDA Plant Genome Program at NAL. This visit introduced the French delegation to U.S. genome efforts and provided an opportunity to discuss areas for future collaboration between the two nations. It has been the good fortune of the Plant Genome Program to gain from the expertise and models developed in the Human Genome Program. This has pushed the plant genome database efforts forward.

—Susan McCarthy



photo: D. Starr

At the meeting of the French human genome research representatives with their counterparts in USDA's Plant Genome Research Program, the French included (L-R) Dr. Michele Durand, Scientific Attaché; Pierre Oudet, Acting Director of Informatics; Michel Cohen-Solal, Research Director at INSERM; and Dr. Jacques Hanoune, Acting Director, Groupement d'Intérêt Public (the French program).

TABLE 1
Number of Indexing Citations Added to AGRICOLA by Topic

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Plant Breeding	1646	1583	1489	1500	6218
<i>% with abstracts</i>	14.8	19.8	42.3	50.0	
Molecular Genetics	1098	880	1166	1000	4144
<i>% with abstracts</i>	18.0	32.8	60.2	60.0	
Economic Crops*	103	88	144	100	435
<i>% with abstracts</i>	15.0	35.2	70.1	75.0	

* Economic Crops include: wheat, loblolly pine, soybean, and corn. These four groups were emphasized by ARS in FY91.

NOTE: Due to the cycle through which records are added to the AGRICOLA database, fourth quarter figures are estimated.

TABLE 2
Number of Indexing Citations Added to AGRICOLA by Specific Identifier/Descriptor

	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	Total
Molecular Sequence Data	274	261	315	275	1125
<i>% with abstracts</i>	21.6	35.6	84.1	—	
Nucleotide Sequences	246	270	360	300	1176
<i>% with abstracts</i>	25.0	34.1	78.3	—	
Amino Acid Sequences	214	215	276	250	955
<i>% with abstracts</i>	26.0	40.0	79.7	—	

— data not collected

NOTE: Due to the cycle through which records are added to the AGRICOLA database, fourth quarter figures are estimated.

BANK/J00207 is added to the citation.

This addition facilitates access to literature containing actual sequence data by both human users and computer applications.

Scope and Depth of AGRICOLA

In addition to including new information in bibliographic citations, TSD has also increased the quantity of serial titles indexed for AGRICOLA and the number of serial titles for which abstracts will be included. This increase in coverage has already had marked effect on the AGRICOLA database. Not only has the monthly contribution of records shown an overall increase in the relevant subject areas, but the quantity of citations containing abstracts has grown dramatically. Actual figures are provided in **Tables 1 and 2** (*in the box on this page*). Sample titles of

serials added to NAL's *List of Journals Indexed* are: *Biochimie*; *Computer Applications in the Biosciences*; *EMBO Journal*; *Gene*; and the *Journal of Biomolecular Structure and Dynamics*. Sample titles for which abstracts are now being added are: *Developmental Genetics*; *Plasmid*; *Genome*; *Journal of Cell Biology*; and *Molecular Microbiology*.

Genetics Terminology

The Indexing Branch of TSD has begun the analysis of genetics terminology as found in the CAB Thesaurus in order to improve access to literature related to plant genome. Current efforts include defining the terms for proper assignment, cleaning-up and constructing hierarchies, and proposing new terms to CABI. About two thirds of the CAB Thesaurus has been reviewed, yielding over 830 descriptors related to genetics and breeding. Staff also analyzed a list of key words used by LANL for the indexing of GenBank. From its 200-page list, candidate terms were highlighted for future investigation.

Training

Key staff members received in-depth subject and database training in order to provide accurate coverage of PGD/C related information. This training included:

- Attending the "Colloquium on the Integration of Information Concerning Biological Macromolecules" to become familiar with the issues concerning the creation of genome databases;
- Touring the Los Alamos National Laboratory (LANL), the creators of the GenBank data bank, for hands-on experience in the processing of sequence data and exposure to the scope of LANL's operation;
- Attending a course on "modern" genetics given by Dr. Paul Bottino to become up-to-date on the latest advances in this field;
- Hosting and attending an informal discussion with Lois Blaine, Chairperson of the CODATA Commission on Standardized Terminology for Access to Biological Data, on the topic of "Biological Nomenclature Standards" to enhance awareness of national and international efforts in this area;
- Receiving in-depth training on the Intel-

ligenetics Suite which contains molecular biology programs that help in the recording, editing, organizing, and analyzing of DNA, RNA, and protein sequence data.

TSD staff also provided PGDIC staff with an overview of TSD activities, guidelines for submitting information, and training on the use of DMLS (USDA's Departmental Mailing List System).

—Sarah E. Thomas

Bigwood Manages Plant Genome Database



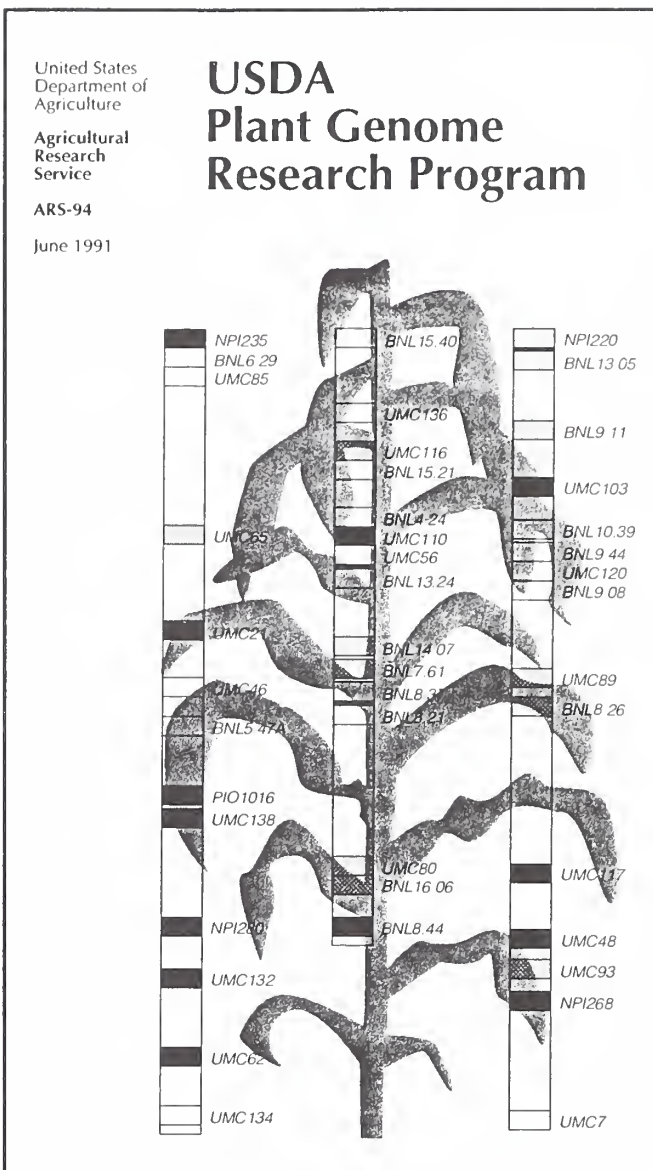
photo: D. Starr

Douglas Bigwood

Through a contract with the University of Maryland, Douglas W. Bigwood, was employed in February 1991 as the Plant Genome Database Manager. He works in NAL's Information System Division developing the database and coordinating database related activities of NAL's Plant Genome Data and Information Center and USDA's Plant Genome Research Program in the participating agencies. He also coordinates this database work with that of other genome

research programs nationally and internationally.

Dr. Bigwood earned his Ph.D. at the University of Maryland in Ecology with minors in Genetics and Statistics in 1983 and his B.S. (*summa cum laude*) in Botany at the University of New Hampshire in 1976. Before joining the plant genome research effort at NAL, beginning in 1976 he held several teaching and staff positions at the University of Maryland, was Technical Project Leader for Program Resources, Inc., and Staff Scientist for Lockheed Engineering and Sciences Company, and since 1989 was self-employed as a Consultant, holding contracts with COMSAT Laboratories, and others, including USDA's Agricultural Research Service. In his work he has had experience with a large number of operating systems and programming languages, and a large variety of hardware and software. His contracting work included development of several expert systems, neural networks, genetic algorithms, an integrated database-hypertext system, and artificial intelligence tech-



Cover of the pamphlet describing USDA's Plant Genome Research Program. To request a copy use the same address or telephone numbers as for **Probe** on page 5.

nology. Dr. Bigwood has authored or coauthored numerous articles in scientific journals and proceedings on expert systems, artificial intelligence, and using them in scientific evaluation programs. He has also been an invited speaker on the same subjects at several scientific and professional conferences.

—Joseph N. Swab

For profiles of other Plant Genome Data and Information Center Staff, see the articles on Susan McCarthy and Deborah Richardson in *ALIN*, 17 (1): 11, 23, January 1991, and Terrance (Price) Henrichs in *ALIN*, 15(4):15, April 1989.

Plant Genome Journals

Abstracts in biocommerce
Annual review of biophysics and biophysical chemistry
Bio essays
Biochemical genetics
Biochemistry
Biochimica et biophysica acta
Biochimie
Biopharm
Biopolymers
Bio/technology
Biotechnology software
Bulletin of mathematical biology
Comments on molecular and cellular biophysics
Comments on theoretical biology
Computer and information systems abstracts journal
Computer applications in the biosciences
Computers in biology and medicine
Current genetics
Database technology
Developmental genetics
Diversity
DNA and cell biology
GEN Guide to biotechnology companies
Gene
Gene amplification and analysis
Genetic analysis techniques and applications
Genome / National Research Council Canada
Genomics
Genetic engineering news: GEN
Journal of biochemistry
Journal of biomolecular structure and dynamics
Journal of cell biology
Journal of chemical information and computer sciences
Journal of molecular biology
Journal of molecular evolution
Journal of molecular graphics
Journal of theoretical biology
Mammalian genome
Mathematical biosciences
Methods in gene technology
Molecular and biochemical parasitology
Molecular & general genetics : MGG
Molecular biology
Molecular microbiology
Nature
Nucleic acids research
Plant biotechnology
Plant journal for cell and molecular biology
Plant molecular biology : an international journal
Planta
Plasmid
Proceedings of the National Academy of Sciences
Sci Tech Book news
Science (Weekly)
Science watch
Scientist
Soviet journal of bioorganic chemistry
Trends in biotechnology
UCLA symposia on molecular cell biology



News Notes

NATDP Update

"Agent Orange," the final pilot CD-ROM of the National Agricultural Text Digitizing Project (NATDP), was distributed in October 1990 for evaluation by the 46 participating land-grant university libraries and Cargill Information Center. The participants completed their evaluations in April 1991. The staff at Iowa State University performed a statistical analysis on the response to all four evaluation discs (Aquaculture I; Food, Agriculture and Science; Acid Rain; and Agent Orange), and began preparing the "Evaluation Study Final Report." The pilot phase of the project will officially end when the report is issued in December 1991.

NAL and the cooperating libraries are planning to establish NATDP as a fully operational program which will continue to share its experience and expertise with the agricultural community. NAL has begun looking at options for upgrading the NATDP system to take advantage of enormous technological improvements that have occurred in the last four years. The system upgrade will be completed in FY92.

The Software Evaluation Team met at NAL October 15-19, 1990, to review the three retrieval packages selected by consultant Pauline Zoellick, and to recommend one of the three. Based on this recommendation, along with the results of the site evaluations, NATDP is negotiating to license state-of-the-art retrieval software, which will be used on future discs. This software license will be in place by December 1991.

Meanwhile, text digitizing work proceeds. The project mastered a CD-ROM containing government studies of "Food Irradiation" in June 1991. The 5,100 pages in this database are from a large collection housed at NAL. (The source publications for the 5,100 pages on the CD-ROM have been donated to a third party, freeing up much needed space in the Library.) The project staff have reviewed the "Agronomy" database, containing volumes 1 through 18 of the *Journal of Agronomy*, and is now ready to premaster a CD-ROM, using the new software, in cooperation with the American Society of Agronomy. Both the "Agronomy" and the "Food Irradiation" databases contain page images which will be accessed through chapter-level bibliographic records included on the discs. These represent NATDP's first experiments with the use of bibliographic records for retrieval, rather than full text.

NATDP is also experimenting with the transfer of collections from microfilm to electronic form. Science Applica-

tions International Corporation, a contractor using a special optical scanner, has scanned three reels of microfilm from a large collection produced by Tuskegee University. The microfilm contains papers and letters of George Washington Carver which are of great historical interest. NATDP staff have created enhanced bibliographic records which will be used to search and retrieve the 3500 images once the database is built. The project will master the database to CD-ROM for distribution in February 1992, and will prepare a Microform Evaluation Report.

NATDP is also scanning material for a second CD-ROM on the topic of Aquaculture, which will contain some of the material from the "Aquaculture I" CD-ROM, plus about 4000 pages of new material. Both page images and fully searchable ASCII text will be included in the database, and the disc is expected to be finished by March 1992.

—Judith A. Zidar

NAL's FY 1992 Appropriation

The Fiscal Year 1992 appropriation for the National Agricultural Library is \$17,715,000.

This amount includes a net increase of \$917,000 over the level appropriated in FY 1991. The specific changes are:

- + \$37,000 for Leflar School of Law
- + 604,000 for replacement of elevators & booklift
- + 276,000 for FY 1992 pay cost increase.

The total amount designated for the Agricultural Law Library in the Leflar School of Law, University of Arkansas will now be \$462,000.

The authorized repair and maintenance level for the NAL building has been increased to a level of \$900,000. This increase will enable NAL to undertake a number of projects over the next few years to improve the facilities and correct deficiencies that exist.

While the above gives the impression that NAL's funding situation has been improved, the dedicated increases do not provide funds for other necessary programs and systems. Chief among these are an upgrading of the ISIS system, increased costs in the library's Document Delivery contract, and several other requirements. Consequently, during Fiscal Year 1992 many NAL programs and operations will have internal funding cuts to fund these requirements. A six month hiring freeze on all vacant positions, current or occurring during the year, is one of a number of cuts the library will make to accomplish necessary adjustments. The net effect of this funding situation is that many NAL programs and systems will be reduced or modified during the fiscal year (October 1991 through September 1992).

—Paul Bennett

Food Irradiation CD-ROM Announced by NATDP

The National Agricultural Library is distributing the third CD-ROM to be produced in-house by the National Agricultural Text Digitizing Project (NATDP). Entitled "Food Irradiation," the compact disc contains 94 non-copyrighted research reports, surveys, and conference proceedings on the high-interest topic.

The U.S. Army Quartermaster Corps produced the publications in the 1950s and 1960s. An information specialist in NAL's Food and Nutrition Information Center selected the publications for the disc from one of several large, paper-based collections on food irradiation donated to NAL. Eventually the project hopes to make the entire collections available in digital form on optical disc.

The NATDP optically scanned the 94 publications included on the CD-ROM to produce digital, bit-mapped page images. NATDP staff then created enhanced bibliographic records reflecting the contents of the pages. These records are included on the disc and can be used for search and retrieval of relevant page images.

This is NATDP's first experiment using bibliographic records for retrieval, rather than full text. The manual effort to upgrade the text generated by optical character recognition (OCR) would have been prohibitively expensive for this material, because of its age and the poor quality of the printing.

The bibliographic records on the disc can be searched and displayed on any standard DOS-based PC with a CD-ROM player and Extensions 2.x. But because the complete text is not available in ASCII full text format, the user must be able to bring up the page images in order to fully utilize the Food Irradiation CD-ROM. The page images are in a proprietary LaserData format, which requires the following equipment for display and printing:

- LaserView high-resolution 17" monitor (150 dpi)
- LaserView compression/decompression board
- Ricoh 4080 laser printer with LaserView board
- LaserData parallel cables

This equipment runs on a standard, IBM PC-compatible 286 or 386 microcomputer with 400 KB free memory, running under DOS 3.x. The retrieval software is TextWare Plus.

If funding becomes available, the disc will be remastered using a standard image format that does not require proprietary display equipment.

NAL is distributing the Food Irradiation CD-ROM to the land-grant libraries equipped with the LaserView display system. Anyone else with the requisite equipment may ob-

tain a free copy of the disc by contacting:

Judith A. Zidar

NATDP Project Coordinator

National Agricultural Library, 5th Floor

10301 Baltimore Boulevard

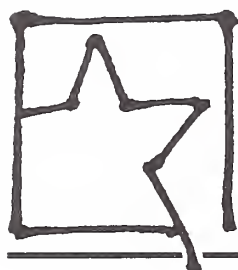
Beltsville, Maryland 20705-2351

Phone: (301) 344-3813

Fax: (301) 344-5473

Internet: JZIDAR@ASRR.ARSUSDA.GOV

— Judith A. Zidar



**Special
Events**

SMITHSONIAN COLUMBUS EXHIBIT OPENS AT NAL DECEMBER 4

A traveling exhibit exploring Christopher Columbus' legacy to North America will initiate a two-year tour of the United States at the National Agricultural Library in Beltsville, Maryland, December 4-21.

Entitled "Seeds of Change," the panel exhibit was developed by the Smithsonian Institution Traveling Exhibition Service and the American Library Association (ALA), and funded by the National Endowment for the Humanities and Beneficial Management Corporation. The traveling exhibit is based on an exhibition developed by, and currently on display at, the Smithsonian Institution National Museum of Natural History in Washington, D.C. Xerox Corporation funded the exhibition at the Smithsonian.

The exhibit commemorates 500 years of cul-

tural and biological exchanges since Columbus' voyages to the New World. Specifically, it demonstrates how the transfer of five "seeds" — sugar, corn, the potato, disease, and the horse — has affected life in both the Old and New Worlds since 1492.

According to coordinators of the exhibit, these five elements reflect a meeting between "the well-established cultures of Europe and the Americas, altering the flora and fauna, changing the ethnic composition of countries in every corner of the globe and transforming the diets and health of people everywhere."

"We are pleased and honored that the Smithsonian and ALA have chosen the National Agricultural Library as the site to open the national tour of this important exhibit," said Joseph H. Howard, NAL Director. "U.S. agriculture was shaped by these 'seeds of change' and it is perhaps fitting that an agricultural setting serve as the backdrop for the premiere of the exhibit."



(Right) Corn god ceramic vessel. Many Pre-Columbian peoples linked corn with the gods. Chimu culture, Valley of Chicama, Peru, 1000-1470. "Seeds of Change" exhibition at the Smithsonian's National Museum of Natural History, October 26, 1991 through April 1, 1993. The "Seeds of Change" traveling exhibit at NAL and other libraries or museums will include panels related to the main exhibit and selected artifacts.



SEEDS of CHANGE

QUINCENTENARY

NATIONAL MUSEUM OF NATURAL HISTORY
SMITHSONIAN INSTITUTION

Constitution Avenue at 10th Street NW
Washington DC 20560



The logo of the Smithsonian's "Seeds of Change" exhibit.

The opening of the "Seeds of Change" traveling exhibit at NAL was arranged in cooperation with the National Visitor Center of USDA's Agricultural Research Service (ARS). The Visitor Center is an educational facility in Beltsville devoted to food and farm sciences.

Following its two-week run at NAL, the exhibit will appear in libraries of major cities across the United States through December 1993.

The American Library Association is arranging for 60 librarians from these cities to travel to NAL on December 9 in order to acquaint them with assembling the exhibit. While at NAL, the librarians and invited guests will attend a reception in honor of the exhibit sponsored by the Friends of the Beltsville Agricultural Research Center, Inc.

NAL is located at 10301 Baltimore Boulevard in Beltsville (at the intersection of U.S. Route 1 and the Capitol Beltway). The exhibit will be open, free of charge, from 8 a.m. to 4:30 p.m., Monday through Friday (except federal holidays). Free parking is available at NAL. School classes are welcome.

Tours of the 7,200 acres of livestock and crop research experiments at the ARS facility in Beltsville can be arranged

in conjunction with NAL tours by calling the ARS National Visitor Center, (301) 344-2483.

— Brian Norris



Information on Agriculture Training Course

CAB International, Wallingford, Oxon, UK
19 July - 7 August 1992

Librarians and information professionals from the developing countries are invited to attend the newly revised 13th Annual CABI Information on Agriculture Training Course. This is the only course devoted specifically to agricultural and related information and the special needs of developing countries.

Training is provided in the use and management of agricultural and related information including: overview of primary and secondary literature sources; principles of indexing and abstracting; computerized information storage and retrieval; database management; the use of PCs in libraries; online and CD-ROM databases (including CAB ABSTRACTS); basics of Micro CDS/ISIS software; CD-ROM technology; establishing networks and linkages; marketing library resources.

Candidates should have written and spoken fluency in English, and professional qualifications. Contact:

The Senior Training Services Officer
CAB International
Wallingford, Oxon. OX10 8DE
UK

— CAB International



Publications Exchange

Surplus Publications

The National Agricultural Library will make available the following surplus publications to any interested organization that regularly sends free publications to NAL, including most Federal, land-grant, and agricultural research institutions as well as many others. Foreign institutions will need to provide a U.S. mailing address or make other special arrangements with U.S. sources for shipment of material. Listed titles may be requested up to six months following announcement.

If interested, please enclose an addressed label with your request and write to:

National Agricultural Library
Attn: Gift and Exchange/RF, Room 002
10301 Baltimore Boulevard
Beltsville, MD 20705-2351

Or call Ruth Finnblade, (301) 344-4061.

New Listings

Abstracts on Tropical Agriculture. Vol. 12, 1987; Vol. 14, 1989.

American Journal of Agricultural Economics. Vols. 64-79, 1982-90.

Rangelands. Vols. 36-44, 1983-91.

Southern Journal of Agricultural Economics. Vols. 19-20, 1987-88.

Previous Listings Still Available

Bibliography of Agriculture. Vols. 37-48, 1974-84.

Census of Agriculture. 1978 (limited issues available).

Current Advances in Plant Science. Vols. 15-16, 1983-84.

Proceedings of the American Society for Horticultural Science. Vols. 56-93, 1950-68.

Rangeman's Journal. Vols. 2-5, 1975-78.

Seed World. Vols. 84-99, 1959-66.

Soil Science Society of America Journal. Vols. 48-53, 1984-89.

Tappi Journal. Vol. 67, 1984.

ALF Can Expedite Requests

Surplus titles above are listed in NAL's Electronic Bulletin Board — ALF (Agricultural Library Forum). The conference is called PTL (Publications Tradeport for Libraries). Check Bulletin #1 for this listing. The use of ALF can expedite your request.

For assistance in using ALF, call the system operator, Karl Schneider at (301) 344-2113 or Ruth Finnblade (301) 344-4061. These numbers are also FTS.

Contributions to Surplus Distribution

Readers of *ALIN* who have surplus agricultural publications that they think might be of use to NAL's surplus distribution program are asked either to send a list of the publications to:

National Agricultural Library
Attn: Surplus Distribution Program/RF, Room 002
10301 Baltimore Boulevard
Beltsville, MD 20705-2351

Or call Ruth Finnblade, (301) 344-4061.



New Bibliographies

Quick Bibliographies

The bibliographies in the *Quick Bibliography* series are primarily computerized online as batch bibliographies emanating from searches performed by the NAL Public Services Division Staff in response to customer requests. Searches are selected for inclusion based on the currency of the topic, interest among clientele, and probable value to a larger audience. Since October 1988, all *QB's* include search strategies. Unless otherwise specified, citations are from AGRICOLA.

The other bibliographic series, including *Special Reference Briefs*, have been researched and produced to meet special needs of clientele of the Library and its Information Centers. Revisions or updates will be announced when produced. Only one copy of a requested title will be sent; however, requesters may make copies. To request a copy of a *Quick Bibliography*, *Special Reference Brief*, or other bibliographic work, circle the desired title(s) below and send your request with a self-addressed label to:

Reference Branch, Room 111
National Agricultural Library
10301 Baltimore Boulevard
Beltsville, MD 20705-2351

Q.B. — 91-149. The Common Agricultural Policy of the

European Community, January 1979-August 1991. 243 citations; languages: none excluded. Prepared by Wayne K. Olson. Reference Branch. September 1991.

Q.B.—91-150. Women in Agriculture, January 1979-July 1991. 470 citations in English. Prepared by Jane Potter Gates. Alternative Farming Systems Information Center. September 1991. Updates Q.B. 89-38.

Q.B.—91-151. Biotechnology: Public Perception, January 1979-August 1991. 70 citations; languages: none excluded. Prepared by Robert D. Warmbrodt and Diana Airozo. Biotechnology Information Center. September 1991.

Q.B.—92-01. Marketing of Horticultural Products, January 1986-August 1991. 209 citations; languages: none excluded. Prepared by Mary E. Lassanyi. Agricultural Trade and Marketing Information Center. October 1991. Updates Q.B. 89-65.

Q.B.—92-02. Conservation Tillage, including Minimum and No-Tillage, January 1979-August 1991. 417 citations in English. Prepared by Jayne T. MacLean. Alternative Farming Systems Information Center. October 1991. Updates Q.B. 90-15.

Q.B.—92-03. Lead Contamination in Soils, January 1979-April 1991. 248 citations; languages: none excluded. Prepared by Henry Gilbert. Reference and User Services Branch. October 1991.

Q.B. 92-04. Composts and Composting of Organic Wastes, January 1987-September 1991. 294 Citations in English. Prepared by Jayne T. MacLean. Alternative Farming Systems Information Center. October 1991. Updates Q.B. 91-27.

Special Reference Briefs

SRB—91-12. Biotechnology: International Affairs. Prepared by Diana Airozo and Robert D. Warmbrodt. Biotechnology Information Center. September 1991.

SRB—92-01. Eastern Europe: Going Global. Prepared by Mary E. Lassanyi. Agricultural Trade and Marketing Information Center. October 1991.

AGRI-TOPICS

AT—92-01. Preservation of Library Materials. Prepared by Robert W. Butler. Reference and User Services Branch. October 1991.

AWIC Series

AWIC—10. Reference Materials for Members of Animal Care and Use Committees. Prepared by D'Anna J. Berry. Animal Welfare Information Center. September 1991.

Miscellaneous

Periodicals Pertaining to Alternative Farming Systems, September 1991. Prepared by Jane Potter Gates. Alternative Farming Systems Information Center. September 1991.



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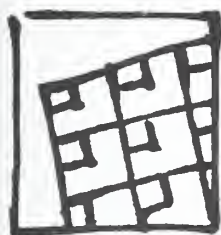
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Agriculture Datebook

December 3-5: Agriculture Outlook '92, 68th Annual USDA Outlook Conference. Washington, DC; USDA. Contact: Gwen Mitchell, 202-720-3160.

December 3-6: Fifth Conference of the International Institute of Fisheries Economics and Trade. Santiago, Chile. Contact: Ann Shriver, Oregon State Univ., Corvallis, OR 97331-1641, Tel: 503-737-2942; FAX 503-737-3447.

December 4: Child Nutrition State Directors Meeting. San Diego, CA. Contact: 703-756-3062.

December 4-6: National Association of Government Communicators Annual Conference. Arlington, VA; Rosslyn Westpark Hotel. Contact: NAGC, 703-519-3902.

December 5-6: 8th Annual Air Resources Information Clearinghouse Conference. Theme: "Global Climate Change: Linking Energy, Environment, Economy and Equity." Washington, DC. Contact: 716-271-3550.

December 5-7: Tree Care Industry Expo '91 Second Annual Trade Show. Columbus, OH; Ohio Center. Contact: Tom Clancy, 1-800-733-2622.

December 7: Economic Considerations of Freshwater Aquaculture. Orlando, FL. Contact: Ronald Gulac, 813-575-1213, FAX 813-639-0801.

December 9-12: American Outdoors Conference. Orlando, Florida. Contact: 202-205-1661.

December 9-12: National Agricultural Aviation Associa-

tion Annual Meeting. Las Vegas, NV; Tropicana Hotel. Contact: NAAA, 202-546-5722.

December 11-14: 25th National Young Farmer Educational Institute. Mobile, AL. Contact: Alvin Halcomb, 205-844-4401.

December 12: Executive Seminar on Agricultural Issues. Sacramento, CA. Contact: 202-720-6030.

December 13: Aquaculture Business Plan. Springfield, IL: Sponsor: Illinois-Indiana Sea Grant Program. Contact: LaDon Swann, Purdue University, 1151 Poultry Science Bldg., West Lafayette, IN 47907-1151; Tel: 317-494-6264.

December 18: American Society of Agricultural Engineers Energy Forum. Chicago, IL. Contact: 202-720-4164.

December 20: Multi-County Extension Agents Meeting. Baraboo, WI. Contact: 202-245-5358.

1992 EVENTS

January 3-4: Canadian Conference for Fisheries Research. Halifax, Nova Scotia. Contact: Steve Campana, 902-426-3233.

January 11-14: Peanut Butter and Nut Processors Association Convention. Palm Springs, CA; Doubletree Resort. Contact: 301-365-4080.

January 11-16: National Turkey Federation Annual Convention. San Antonio, TX. Contact: 804-435-7206.

January 12-16: American Farm Bureau Federation's 73rd Annual Meeting. Kansas City, MO. Contact: AFBF, 202-484-3600.

January 12-16: The National Aquaculture Association, The American Tilapia Association, The Striped Bass Growers Association, and The U. S. Aquaculture Suppliers
(Continued, see Agriculture Datebook, page 24, col. 1.)

LIST OF KEY NAL PERSONNEL AND SERVICES

NAL ORGANIZATION	Contact	Area Code 301-Local #	FTS #*
Director	Joseph Howard	504-5248	964-5248
Assistant Director for Policy and Planning	Maria Pisa	504-6780	964-6780
Public Affairs Specialist	Brian Norris	504-6778	964-6778
Special Services & Communications	Joseph Swab	504-6778	964-6778
Administrative Manager	Marlene Taylor	504-5570	964-5570
Budget Officer	Paul Bennett	504-5570	964-5570
Facilities Manager	Clarence Keen	504-5843	964-5843
Associate Director for Automation	Pamela Andre	504-6813	964-6813
Assistant to Assoc. Dir., Automation	Richard Thompson	504-6813	964-6813
Database Administration Branch	Gary McCone	504-6813	964-6813
Current Awareness Literature Service	Anita Speight	504-6859	964-6859
OCLC Coordinator	David Goldberg	504-6813	964-6813
Text Digitizing	Judi Zidar	504-5853	964-5853
Library Automation Branch	Bill Feidt	504-6813	964-6813
ISIS Coordinator	Robertta Rand	504-6813	964-6813
ISIS Support Line	Chuck Schoppet	504-6342	964-6342
Associate Director for Public Services	Keith Russell	504-5834	964-5834
Assistant to Assoc. Dir., Public Services	Janice Kemp	504-5834	964-5834
ARS Field Libraries	Peggy Beavers	504-5834	964-5834
Document Delivery Services Branch	Carol Ditzler	504-6503	964-6503
Circulation Section (& Interlibrary Loan)	Tanner Wray	504-6503	964-6503
INFORMATION & Circulation Desk	NAL Staff	504-5755	964-5755
Loan Renewals	NAL Staff	504-5798	965-5798
Stack Passes	NAL Staff	504-5755	964-5755
NTIS - ILL Billing	Kim Hicks	504-6503	964-6503
Regional Document Delivery System	Tanner Wray	504-6503	964-6503
Interlibrary Borrowing Section	Michael Thompson	504-6715	964-6715
Search Section	Julie Mangin	504-5879	964-5879
Information Centers Branch	Robyn Frank	504-5719	964-5719
Agricultural Trade & Marketing Inf. Ctr	Mary Lassanyi	504-5704	964-5704
Alternative Farming Systems Info. Ctr	Jayne MacLean	504-5704	964-5704
Animal Welfare Information Center	Jean Larson	504-6212	964-6212
Aquaculture Information Center	Debbie Hanfman	504-5704	964-5704
Food and Nutrition Information Center	Sandy Facinoli	504-5719	964-5719
Rural Information Center	Patricia John	504-5372	964-5372
Youth Development Information Center	John Kane	504-5719	964-5719
Reference & User Services Branch	Leslie Kulp	504-6875	964-6875
Coordinator of Information Programs	Alvetta Pindell	504-6875	964-6875
Reference Section	John Forbes	504-5204	964-5204
Reference Desk	Librarian on Duty	504-5479	964-5479
Grain Dust Project	Sheldon Cheney	504-5204	964-5204
Periodicals Reading Room	Patricia Krug	504-5204	964-5204
Russian Wheat Aphids Project	Wayne Olson	504-5204	964-5204
D. C. Reference Center	Janet Wright, Acting	202-720-3434	720-3434
D. C. Reference Desk	Librarian on Duty	202-720-3434	720-3434

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Arboretum Library	Susan Chapman or Wayne Olson	504-5402 504-5402	964-5402 504-5402
Educational Programs Section	Susan Fugate	504-5779	964-5779
Exhibits Planning & Scheduling	Susan Fugate	504-5779	964-5779
AGRICOLA Training Registration	Kate Baker	504-5204	964-5204
Orientation & Tours	Susan Fugate	504-5779	964-5779
Technology & Software Demonstration Centers	Paul Hosman	504-7114	964-7114
Biotechnology Information Center	Robert Warmbrodt	504-6875	964-6875
Global Change Initiative	Janet Wright, Acting	202-720-3434	720-3434
Plant Genome Data and Info. Center	Susan McCarthy	504-6875	964-6875
Preservation and Access Program	Alan Fusonie, Acting	504-6875	964-6875
Special Collections Program	Alan Fusonie	504-5876	964-5876
Special Collections Reading Room	NAL Staff	504-5876	964-5876
Nursery & Seed Trade Catalogs	NAL Staff	504-5876	964-5876
Technology Transfer Information Center	Kathleen Hayes	504-6875	964-6875
Water Quality Information Center	Janice Kemp	504-6875	964-6875
Associate Director for Technical Services	Sarah Thomas	504-5018	964-5018
Systems Librarian, TSD	Claudia Weston	504-5018	964-5018
Acquisitions & Serials Branch	Caroline Early	504-6806	964-6806
Collection Development	Ellen Pletsch	504-5569	964-5569
Exchange and Gift	Rae DuBois	504-5210	964-5210
GPO Depository	Ruth Wertman	504-6321	964-6321
Monographs and Fiscal	Karl Debus	504-6999	964-6999
Serials and Binding	Win Gelenter	504-6573	964-6573
Cataloging Branch	Idalia Acosta	504-7728	964-7728
CONSER Coordinator	Kathleen Dougherty	504-5046	964-5046
NACO Coordinator	Donna Collins	504-6730	964-6730
Data Control	Carolyn Thurman	504-5054	964-5054
Indexing Branch	Shirley Edwards	504-6829	964-6829
Head, Thesaurus Management Section	Martha Hood	504-6829	964-6829
Head, Animal Section	Donald Blamberg	504-6829	964-6829
Head, Plant Section	Janet Berkson	504-6829	964-6829

OTHER SERVICES	Contact	Area Code 301-Local #	FTS #*
FAX (All NAL except those listed below)		504-5472	964-5472
FAX, Office of the Director		504-7042	964-7042
FAX, Technical Services Division		504-5471	964-5471
FAX, Information Systems Division		504-7473	964-7473
FAX, Reference & User Services Branch			
FAX, Rural Information Center		504-5181	964-5181
FAX, D. C. Reference Center		202-720-0342	720-0342
FAX, Document Delivery only		504-5675	964-5675
ALF [NAL's Electronic Bulletin Board]	504-6510, 504-5111, 504-5496, 504-5497		
	FTS: 964-6510, 964-5111, 964-5496, 964-5497		
ALF Systems Operator (voice)	Karl Schneider	504-5113	964-5113

* FTS # is for Federal Government Agencies only = Federal Telecommunications System

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(Agriculture Datebook, from page 21)

Association in conjunction with Aquaculture Expo V: The Wave of the Future. New Orleans, LA. Contact: Carroll Troclair (Program), 504-482-9500, FAX 504-488-4135; or Bill Glasscock (Trade Show), 1-800-467-3350 or 501-225-6102, FAX 501-223-8230; or Hugh Purnell (Registration), phone 501-851-7500, FAX 501-851-1122.

January 13: Service-Wide Civil Rights Conference. Santa Fe, NM. Contact: 202-205-1661.

January 13-31: Molecular and Cellular Techniques in Plant Breeding. Zaragoza, Spain. Contact: Instituto Agronómico Mediterráneo de Zaragoza, Apartado 202, 50080 Zaragoza, Spain. Telephone: 34-76-57 60 13; FAX: 34-76-57 63 77. Note: Deadline September 30, 1991.

January 17-24: 1992 Miami Bio/Technology Winter Symposium. Advances in Gene Technology: Feeding the World in the 21st Century. Miami Beach, FL. Contact: PO Box 016129, Miami FL 33101-6129. Telephone: 1-800-642-4363; FAX 1-305-324-5665.

January 19-24: National Council of Farmer Cooperatives 63rd Annual Meeting. Orlando, FL; Marriott's Orlando World Center. Contact: NCFC, 202-626-8700.

January 22-23: Organic '92, an Organic Farming Symposium. Pacific Grove, CA: Asilomar Conference Center. Contact: Small Farm Center, University of California, Davis, CA 95616, 916-757-8910.

January 23-25: 12th Annual Ecological Farming Conference. Pacific Grove, CA: Asilomar Conference Center. Contact: Otis Wollan, Committee for Sustainable Agriculture, 916-346-2777.

January 25-February 1: Molecular Mechanisms in DNA Replication & Recombination. Taos, NM. Contact: Keystone Symposia, Drawer 1630, Dept. S, Silverthorne, CO 80498, Telephone: 303-262-1230; FAX 303-262-1525.

January 29-31: President's Council on Rural America. Williamsburg, VA. Contact: 202-720-4581.

January 29-February 1: Texas Aquaculture Association Conference and Trade Show. Corpus Christi, TX. Contact: TAA, 512-474-5263.

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Also in this issue...

List of Key NAL Personnel & Services with new Telephone #s, pp. 22-23

Plant Genome Research Program, pp. 1-10

National Agricultural Text Digitizing Project Update, p. 10

NAL's FY 1992 Appropriation, p. 11

Food Irradiation CD-ROM, pp. 11-12

Smithsonian's "Seeds of Change" Exhibit at NAL, pp. 12-13

CABI's Information on Agriculture Training Course, p. 13

Publications Exchange, p. 14

New Bibliographies, pp. 14-15

New Serials, pp. 15-21

Agriculture Datebook, pp. 21, 24

...and more